REMARKS

By this amendment, claims 1-8 have been revised to place this application in condition for allowance. Currently, claims 1-12 are before the Examiner for consideration on their merits.

Claims 1-4 have been revised to correct a typographical error so that the alloying element of Cu is properly identified. Since the prior amendment was not entered, this amendment is again submitting the change to claims 1-4 in this regard.

Claims 1-4 are also revised to change "comprising" to "consisting of". Dependent claims 5-8 are also revised to provide consistent language with respect to their respective independent claims.

Turning now to the prior art rejection, Applicants traverse the rejection on the grounds that the Examiner has not established the obviousness of the claimed invention.

In traversing the rejection, the arguments are set out below in combination with a discussion of the invention.

INVENTION

The technical concept of the invention can be found in paragraphs [0018] to [0022] of the instant application's publication. That is, the inventors have discovered that a martensitic steel can have excellent corrosion resistance if the amounts of carbides are reduced and the steel is processed to have one of a hot finished condition, an as quenched condition, or low temperature tempered condition.

These improvements are attained by having the claimed combination of copper and molybdenum in the alloy so that copper sulfide and molybdenum sulfide provide a very fine dense layer onto the chromium oxide file, and therefore, a protection effect on the chromium oxide film is provides, thus obtaining resistance to sulfide stress corrosion cracking.

Secondly, almost no $M_{23}C_6$ type carbide exists as a result of the as-quenched or as hot-worked state. Without the precipitation of the $M_{23}C_6$ type carbide, improvements are realized in the resistance to sulfide stress corrosion cracking.

Thirdly, an increase in hardness of the steel provides a proper resistance to corrosive wear.

The condition of the steel to attain the benefits can be found in paragraphs [0074] to [0076] of the publication and can be described as follows:

1) after hot working, wherein subsequent to heating to the temperature of Ac_3 point or more, the quenching treatment or air cooling is carried out;

2) the steel is cooled to room temperature, and then heating to the temperature of Ac_3 point or more is performed following by a quenching treatment or air cooling;

3) after the cooling step, tempering can be performed just that it is a low temperature tempering step, i.e., 400 °C or lower. In this regard, it should be noted that Table 2 in the Examples section shows a tempering of 250 °C for a 30 minute duration as being within the invention, whereas a temperature of 600 °C and 30 minutes is outside the scope of the invention.

ARGUMENTS

In the rejection, the Examiner takes the position that Jung establishes a *prima facie* case of obviousness against the claims because of overlap of the claimed alloying ranges.

With regard to the formula, the Examiner contends that since Jung teaches a range of Mo and Cu that could fall within the formula, one of skill could use Mo and Cu amounts so as to satisfy the formula.

The Examiner contends that the hardness would be inherent as would be the limitation regarding the amount of carbides at the grain boundaries in the prior austenite. In this regard, the Examiner points to the tempering treatment of Jung and col. 4, lines 42-49.

It is contended that the Examiner's rejection is flawed for a number of reasons and that the rejection must be withdrawn. The claims now use the term "consisting of"

and this differentiates the invention from Jung. Also, the Examiner is mixing allegations of obviousness and anticipation in the rejection, and this alone makes it improper. That is, the Examiner is saying that one of skill in the art would be motivated to arrive at the invention, and then conclude that the advantages of the invention tag along with it.

What Applicants have done here is to develop an improved steel with improved properties by close control of composition and processing and the use of a mechanism entirely different from Jung. Whereas Jung uses precipitation hardening, Applicants use the dense layer of sulfides as noted above, thereby providing the resistance to sulfide stress cracking. Practicing a process which avoids the precipitation of $M_{23}C_6$ also allows this resistance to be obtained.

The improvements associated with the invention are shown through comparative testing in the specification. The invention of Jung is entirely different from that of Applicants. In spite of this, the Examiner insists that, since there is similarity in composition (which there is not as shown below), one would arrive at the invention of Applicants. It is submitted that one would not get to the instant invention through the teachings of Jung, and the unexpected improvements shown in the specification regarding resistance to sulfide stress corrosion cracking, corrosion improved wear, and local corrosion resistance demonstrate the claims 1-4 describe an invention that it not taught or suggested by Jung.

The more specific arguments are set forth below under their respective headings.

USE OF THE TERM "CONSISTING OF"

Claims 1-4 are revised to close the claims by virtue of the term "consisting of". As the Examiner knows, this term closes the claims by excluding elements not contained therein. This amendment effectively removes Jung as prior art since Jung and the inventive alloy are fundamentally different.

First, there is no recitation of W in claims 1-12, and W is excluded from the claims by the presence of the term "consisting of".

Second, Jung requires W as an essential element and for this reason Jung cannot anticipate claims 1-4. More specifically, Jung relates to a martensitic steel that contains

W as a required element. In each embodiment of the "Summary of the Invention" section, the disclosed composition defines a lower limit of 0.5% W. Each of the independent claims 1, 5, and 7 also defines a composition that contains W.

Col. 3, lines 41-51 also affirmatively teaches that W is a vital element of the composition of Jung. The lower limit of 0.5% is clearly identified as is an upper of 6.0%. The fact that Jung teaches a preferred range of 0.4 to 4.5% does not mean that W is optional; it only means that it is preferred that no more than 4.5% W is used rather than the larger amount of 6.0%.

Turning to the Examples of Jung in Table 1, each of Examples 1-8 includes 1.0% W. While the comparative examples 1-4 do not contain W, the alloys without W are vastly inferior to those that contain W, see Table 2 in col. 5 of Jung. While it could be argued that comparative example 4 is close to Inventive Example 1 of Jung since each contain Mo, the comparison in Table 2 reveals a significant drop in properties when W is not present. This is consistent with the teachings of Jung that the presence of W increases mechanical strength and pitting resistance, and both of these properties are lacking in comparative example 4.

In addition, comparative example 4 cannot be relied upon by the Examiner since its levels of Ni, Cr, and Mo all fall outside the claimed range, and it also lacks the required Cu of claims 1-4.

Also, given that W is an expensive alloying element, Jung would not teach the addition of W in an arbitrary manner and without a definite aim in mind. Thus, it can only be interpreted that when W is suggested, it is there for a definite purpose.

In light of the above, it is contended that W is a required element of Jung. Since claims 1-8 are closed to the presence of additional elements, and W is not claimed as an alloying element, the Examiner cannot rely on 35 U.S.C. § 102 to reject claims 1-8.

The only recourse the Examiner has is to rely on 35 U.S.C. § 103(a) and the contention that it would be obvious to modify Jung in some way so as to arrive at the composition of claim 1. Since Jung clearly teaches W as an essential element, the only source for rejecting the claims would be to rely on the comparative alloys to allege obviousness. However, none of these alloys can be relied up to teach the invention.

Comparative examples 1-3 lack W and Mo, and cannot meet the claimed limitations regarding Mo. Comparative example 4 has Mo, but an insufficient amount to meet the claimed formula. In addition, the levels of Ni and Cr in comparative example 4 are outside the claimed ranges of claims 1-4, and this example also lacks Cu. Comparative examples 5 and 6 are excluded since they each contain W. Thus, the comparative examples provide no basis to allege obviousness.

The only other way the Examiner could reject claims 1-8 would be to allege that it would be obvious to modify the alloy of Jung and remove W. This modification is without the requisite motivation in the prior art since there is no reason whatsoever that any one of skill in the art would remove W from the inventive alloys of Jung.

If anything, Jung teaches away from such a modification, since it is W that provides an essential increase in strength and pitting resistance as compared to the prior art alloys that were tested. This teaching away substantiates the argument that there is no legitimate basis to remove the W of Jung and allege that one of skill in the art could arrive at the invention of the instant application based on the teachings of Jung. Any such contention is the blatant reliance on hindsight to formulate a rejection under 35 U.S.C. § 103(a), and such a further rejection would be surely reversed upon appeal.

As stated above, the present invention achieves its improvements in properties through an entirely different mechanism than the precipitation of W as taught in Jung. Therefore, Jung cannot be relied upon to reject claims 1-8, either from an anticipation standpoint or one of obviousness.

TEMPERING

Critical to the Examiner's rejection is the assumption that one of skill in the art would be motivated to use the claimed ranges and also practice a tempering step that would result in the claimed carbide amount. Applicants strenuously contend that one of skill in the art would not be motivated to use a low temperature tempering step as is done in the invention to obtain the desired carbide amounts.

Turning to Table 2 of Jung, and the description in col. 5, lines 55-61, the Inventive Examples 1-8 show higher yield strength compared to the Comparative

Examples 1-4 of the same table. At the same time, the elongation values are similar. For example, Example 6 has a yield strength of 110.2 kgf/mm^2 and an elongation of 11%.

The same steel for Example 6 is then tested for the effect of tempering temperature, see col. 6, beginning at line 53. The results of this test are shown in Figures 1 and 2. Figure 1 shows the effect on yield strength for varying tempering temperature and Figure 2 shows the effect on elongation for varying tempering temperature. Jung also notes that the effect for Example 6 in Figures 1 and 2 is the same for the other examples.

What Figures 1 and 2 tell one of skill in the art is that to maintain the yield strength for Example 6 as shown in Table 2, one must use a tempering temperature range between 450-550 °C. Similarly, high tempering temperatures are required to maintain the 11% elongation for Example 6. This means that Jung suggests a high temperature tempering temperature to attain the desired properties in his steel. Carrying out a low temperature temper results in properties which are considered unacceptable in light of Table 2.

What Jung teaches one of skill in the art is that high temperature tempering is required, and Jung does not suggest processing a steel without tempering or at low temperature tempering as is required for the invention to obtain the claimed properties. In fact, Jung teaches away from the absence of tempering or a low temperature tempering step. This teaching away is further substantiation that the invention is not obvious based on Jung.

In the rejection, the Examiner is essentially saying that since Jung discloses a range of tempering temperatures, including one that falls below 400 °C, one of skill in the art would be motivated to develop the claimed ranges of alloying elements and process the steel using a low tempering temperature treatment. This allegation flies in the face of the teachings of Jung and cannot be derived from the teachings of this reference.

Jung achieve his aim through precipitation hardening, particularly Cu and W, see col. 5, line 8 and col. 3, lines 42-43. In addition, Figures 1 and 2 indicate that high

temperature tempering is required to maintain the levels of strength and elongation as shown in Table 2. Thus, one of skill in the art would not be motivated to manipulate the teachings of Jung and arrive at the steel and its properties as defined in claims 1-4. To draw any other conclusion is the use of hindsight in light of Applicants' disclosure.

HARDNESS

The Examiner conclusion that the overlap in composition results in the claimed hardness is refuted by the evidence in the specification. In Table 3, Examples 10, 18, and 24, alloys falling within the claimed ranges do not exhibit the claimed hardness level. This alone means that the Examiner cannot conclude that the claimed hardness levels are necessarily present. The Examiner is called upon to provide a further basis to make this contention in any subsequent Office Action.

PRECIPITATION

As noted above, Jung uses the function of M_2C carbide precipitation to attain his desired properties of better mechanical strength at high temperature, tempering resistance, and pitting corrosion resistance. This is attained using W and Cu, and the high end tempering temperature becomes indispensable for affecting the precipitation hardening function and its attendant results.

The invention goes down a completely different road. A steel is made using an entirely different concept of controlling composition and processing conditions so that the desired properties can be obtained, including that the amounts of carbide in prior austenite grain boundaries are not more than 0.5% by volume.

Given the fundamental difference between the teaching of Jung and the instant invention regarding Jung's use of precipitation hardening, and the invention's control of composition and processing, Jung does not obviate the invention.

Moreover, the results in Table 3 show that only the alloys that fall within the claimed range of alloying elements, and are processed with either no tempering or low temperature tempering have the claimed combination of hardness and carbide amount. As importantly, the steels of the invention have all three qualities of resistance to local

corrosion, corrosion wear and sulfide stress cracking. These results are surprising and not evident from the teachings of Jung. The evidence in the specification clearly rebuts any contention that Jung teaches or suggests the invention. Applicants are able to obtain three excellent corrosion properties, resistance to sulfide stress cracking, local corrosion resistance, and corrosion wear resistance. The evidence shows that alloys without the claimed composition and the claimed hardness and carbide amount do not exhibit the surprising combination of all three. Jung does not refute the unexpected combination of corrosion resistance, and any alleged *prima facie* case of obviousness based on this reference is effectively rebutted.

HIRAMATSU

The reliance on Hiramatsu is noted. However, this reference does not make up for the deficiencies noted above in Jung. Hiramatsu is totally silent on the features of the invention. Therefore, even if Hiramatsu were combined with Jung, the invention is still not taught.

SUMMARY

It is respectfully contended that Jung does not establish a *prima facie* case of obviousness against the invention. Jung employs a fundamentally different approach than that of the invention, and the fact that claims 1-8 now exclude W as an element removes Jung as a viable reference from either an anticipation or obviousness standpoint. Moreover, the specification clearly demonstrates that the composition and processing are critical to attaining the claimed hardness and carbide amount, and these characteristics are neither inherent in the Jung nor attainable from Jung's teachings. Consequently, the rejection as applied to independent claims 1-12 should be withdrawn.

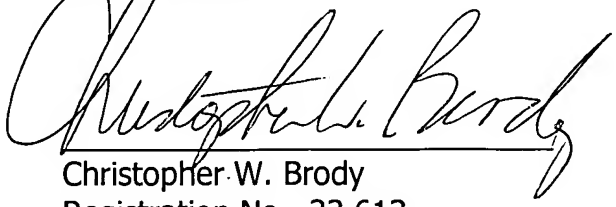
Accordingly, the Examiner is respectfully requested to examine this application and pass claims 1-12 onto issuance.

If the Examiner believes that an interview with Applicants' attorney would be helpful in expediting prosecution of this application, the Examiner is respectfully requested to telephone the undersigned at 202-835-1753.

Again, reconsideration and allowance of this application is respectfully requested.

Please charge any fee deficiency or credit any overpayment to Deposit Account No. 50-1088.

Respectfully submitted,
CLARK & BRODY



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